

CLAIMS:

1. A manufacturing method for semiconductor devices comprising the steps of: loading an object to be processed into a processing chamber, generating an activated gas by bubbling ozone in fluid containing at least hydrogen atoms, supplying the generated gas into the processing chamber and processing the object to be processed, and unloading the object to be processed from the processing chamber after processing, wherein the processing temperature in the step for processing the object to be processed is greater than the temperature of the fluid containing hydrogen atoms.

2. A manufacturing method for semiconductor devices comprising the steps of: loading an object to be processed into a processing chamber, generating an activated gas by bubbling ozone in fluid containing at least hydrogen atoms, supplying the generated gas into the processing chamber and processing the object to be processed, and unloading the object to be processed from the processing chamber after processing, wherein the processing temperature in the step for processing the object to be processed is 100 to 500°C.

3. A manufacturing method for semiconductor devices comprising the steps of: loading an object to be processed into a processing chamber, generating an activated gas by bubbling ozone in fluid containing at least hydrogen atoms, supplying the generated gas into the processing chamber and forming an oxide film on the object to be processed, and

unloading the object to be processed from the processing chamber after processing.

4. A manufacturing method for semiconductor devices comprising the steps of: loading an object to be processed into a processing chamber, generating an activated gas by bubbling ozone in fluid containing at least hydrogen atoms, supplying the generated gas into the processing chamber and etching an oxide film formed on the object to be processed, and unloading the object to be processed from the processing chamber after processing.

5. A manufacturing method for semiconductor devices comprising the steps of: loading an object to be processed into a processing chamber, generating an activated gas by bubbling ozone in fluid containing at least hydrogen atoms, supplying the generated gas and material gas into the processing chamber and forming a film on the object to be processed by thermal CVD method, and unloading the object to be processed from the processing chamber after processing.

6. A manufacturing method for semiconductor devices comprising the steps of: loading an object to be processed into a processing chamber, processing the object to be processed in the processing chamber, unloading the object to be processed from the processing chamber after processing, generating an activated gas by bubbling ozone in fluid containing at least hydrogen atoms, supplying the generated gas into the processing chamber with the object to be

processed unloaded to remove contamination substance in the processing chamber.

7. A manufacturing method for semiconductor devices according to claim 1, wherein in the step for processing the object to be processed, an oxide film is formed on the object to be processed or a film is formed on the object to be processed by thermal CVD method in an atmosphere containing the generated gas and material gas.

8. A manufacturing method for semiconductor devices according to claim 1, wherein in the step for processing the object to be processed, an oxide film formed on the surface of the object to be processed is etched, or a semiconductor or a metal as the object to be processed is etched, or a natural oxide film or organic contamination substance or metal contamination substance formed on the surface of the object to be processed is removed.

9. A manufacturing method for semiconductor devices according to claim 7, wherein the processing temperature in the step for processing the object to be processed is 100 to 500°C.

10. A manufacturing method for semiconductor devices according to claim 8, wherein the processing temperature in the step for processing the object to be processed is 50 to 400°C.

11. A manufacturing method for semiconductor devices according to claim 2, wherein in the step for processing the object to be processed, an oxide film is formed on the object to be processed, or a film is formed on the object to be processed by thermal CVD method in an atmosphere containing the generated gas and material gas.

12. A manufacturing method for semiconductor devices according to claim 1, wherein hydroxyl (OH) radicals are generated in the step for generating the activated gas.

13. A manufacturing method for semiconductor devices according to claim 1, wherein the activated gas is a gas containing a hydroxyl.

14. A manufacturing method for semiconductor devices according to claim 1, wherein the fluid for bubbling the ozone is a fluid containing at least hydrogen (H) atoms and oxygen (O) atoms.

15. A manufacturing method for semiconductor devices according to claim 1, wherein the fluid for bubbling the ozone is water(H₂O).

16. A manufacturing method for semiconductor devices according to claim 1, wherein the fluid for bubbling the ozone is deionized water (pure water).

17. A manufacturing method for semiconductor devices according to claim 1, wherein the fluid for bubbling the ozone is hydrogen peroxide water solution (H_2O_2).

18. A manufacturing method for semiconductor devices according to claim 1, wherein the fluid for bubbling the ozone contains hydrogen chloride (HCl).

19. A manufacturing method for semiconductor devices according to claim 1, wherein the fluid for bubbling the ozone is a fluid containing at least a hydroxyl.

20. A substrate processing apparatus comprising: a processing chamber for processing an object to be processed, a heater for heating the object to be processed in the processing chamber, an ozonizer for generating ozone, a bubbler for generating activated gas by bubbling ozone generated by the ozonizer in fluid containing at least hydrogen atoms, a supply pipe for supplying the activated gas generated by the bubbler into the processing chamber, and a control means for regulating the processing temperature during processing of the object to be processed so that the processing temperature is higher than the temperature of the fluid containing hydrogen atoms.